REMARKS

Applicant here provides 10 sheets of replacement drawings for the informal drawings filed with this application. These replacement drawings include the labeling of Fig. 4A as such, and provide the numeral 42b in Fig. 4B with a lead line to the appropriate place on Fig. 4B. Applicant has also deleted from the legend below Fig. 4A the words "prior art" because the specification indicates that Fig. 4 shows an embodiment of the invention, not prior art.

Applicant has amended the specification at pages 15, 16, 20 and 32 as the PTO requires, and has amended claims 43, 48, 50, 51, 56 and 66 as required at page 3 of the action.

Applicant here encloses, to overcome the prior art rejection based upon the Jung et al. article, a declaration under Rule 131 from Craig Prater, one of the named inventors. Mr. Prater's Rule 131 declaration establishes that Applicants had reduced the invention to practice before the publication date of the Jung article, thus removing this article as prior art.

With this amendment, all issues on this record appear resolved. Respectfully, we request notice of allowance. Applicant's counsel welcomes a telephone call at any time to discuss any matter.

Respectfully submitted,

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Patrick F. Bright, Reg. No. 24,318
Bright & Lorig, P.C.
633 West Fifth Street, Suite 3330
Los Angeles, CA 90071
TEL: 213-627-7774
FAX: 2130627-8508
pbright@brightlorig.com

EXHIBIT A

EXHIBIT A

"Version with markings to show changes made"

IN THE SPECIFICATIONS

Fig. 4B is a diagram of a tube scanner having an asymmetric cut out.

Fig. 5 is a modification of the first embodiment shown in Fig. [4] 4A, with the addition of a removable fluid cell allowing operation of the sample covered by fluid.

Fig. 6 is a modification of the first embodiment shown in Fig. [4] 4A, where the laser is mounted at the side of the scanner;

Fig. 14 is a flowchart of a method of operating the atomic force microscope of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, and more particularly to Fig. 4, a first embodiment of the invention will be described. The AFM illustrated in Fig. [4] 4A contains a light source 10, such as

matched to a property that can be called the "mechanical amplification" of the scanner 12, or the ratio of the optical assembly 43 motion to the cantilever 14 motion. If the construction and position of optical assembly 43 are such that these magnifications are matched, the light beam 43 will track the moving cantilever 14.

Fig. 6 is a modification of the embodiment shown in Fig. [4] 4A. The light source has been positioned to the side of the

substantially a fixed point is illustrated in Fig. 13, where light beams 101 strike cantilever 14 while it is scanned across sample 13. The light beam reflected from cantilever 14 (47 in Fig. [4] 4A) is received by position detector 16 which can detect deflections of cantilever 14.

IN THE CLAIMS

43. (amended) [The] An atomic force microscope as recited in claim 42, wherein light reflected to said position detector does not pass through said steering lens.

48. (amended) A method of operating an atomic force microscope having an optical lever system with a light source, a cantilever, and a position detector, and further having a steering lens assembly attached to a steering mechanism, the method comprising the steps of:

generating light;

directing said light onto said cantilever using said steering lens assembly so that said light strikes a substantially fixed position on said cantilever during a movement of said scanning mechanism; and

receiving a reflected light reflected from said cantilever using said position detector to detect an angular deflection of said cantilever.

50. (amended) A scanning force microscope device comprising in combination:

a. a sensing probe having a substantially reflective surface on one side and a scanning tip on the opposite side, said tip adapted to be positioned adjacent a surface to be scanned;

b. illuminating means for generating a radiant energy beam and for applying said beam to said reflective surface;

c. position control means coupled to said sensing probe for moving said scanning tip substantially parallel to a surface to be scanned in a predetermined direction and for moving said scanning tip orthogonal to the surface to follow the [counters] contours of the surface;

d. beam positioning means for directing said radiant energy beam to follow said sensing probe through lateral motion of said probe; and

e. detector means adapted to receive the energy beam reflected from said reflective surface and operable in response to movement of said reflected energy beam corresponding to position changes to said sensing probe relative to the surface to be scanned to produce a motion representing signal corresponding to tip movement following the contours of the scanned

surface, whereby tip motion in a direction orthogonal to scanning motion results in a series of electrical signals corresponding to and representative of the surface contours of the scanned surface.

51. (amended) In a scanning force microscope having a sensing lever having a tip mounted for movement in response to relative vertical distance changes between the tip and a sample surface as the tip moves laterally with respect to the sample surface, apparatus for sensing the vertical movement of the tip relative to the surface being scanned and for creating a signal representative of such vertical movement comprising:

a a reflective surface carried by the sensing lever;

b. an energy source positionally decoupled from lateral movement of the sensing lever for emitting a radiant energy beam including focusing means for applying said beam to said reflective surface;

c. control means for moving the sensing lever and tip laterally over the surface of a sample to be scanned including beam directing means for causing said radiant

energy beam to follow the lateral motion of the sensing lever;

d. driving means for moving the sensing lever and tip in a vertical direction towards and away from the surface of the sample to be examined; and

e. detection means positioned to receive said energy beam after reflection from said reflective surface for signaling changes in the beam position, said changes corresponding to and being representative of vertical displacement of the sensing [elver] lever tip during lateral motion over the sample surface.

66. (amended) In a scanning force microscope having a lever with a reflecting surface and a sensing tip wherein the sensing tip is responsive to forces resulting from the proximity of the sensing tip to a sample surface under investigation, apparatus for sensing the response of the tip to the forces comprising:

a. a light beam source for generating a light beam;

b. a motion control device for creating relative motion between the sensing tip and the sample surface, said motion control device having a fixed end and a free end, said free end being adapted to provide relative scanning motion between the scanning tip and the sample surface;

c. at least one lens interposed in said beam of light between said source and the reflecting surface, said lens fixed to the frame of reference of said free end of said motion control device such that said lens causes said beam to track laterally the motion of said reflecting surface; and

d. a detection device for detecting light reflected from the reflecting surface.

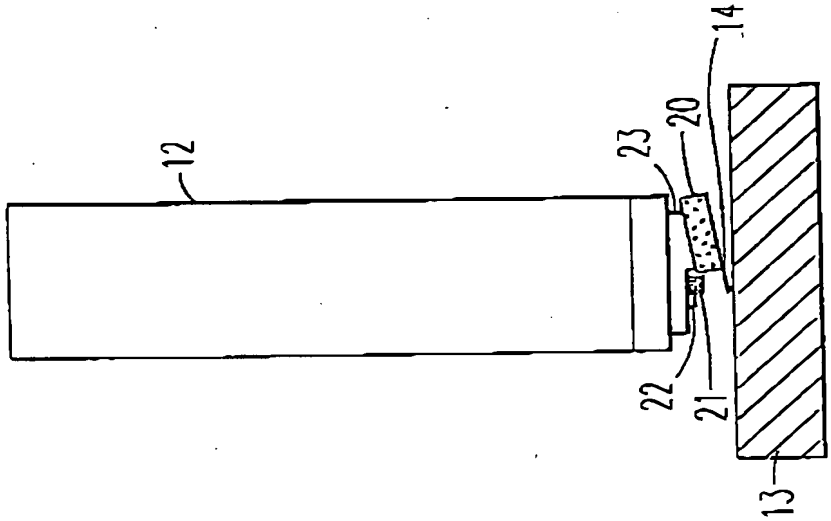


FIG. 2
PRIOR ART

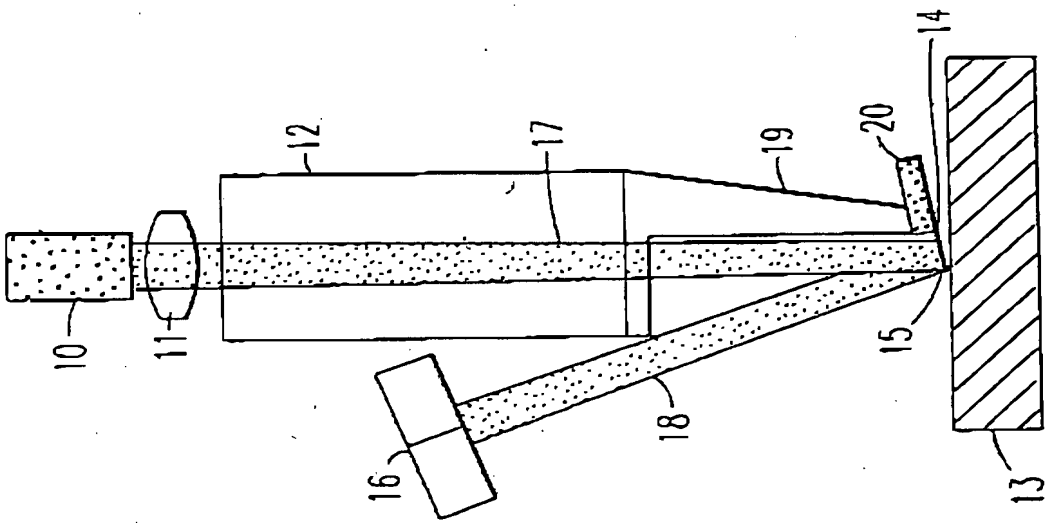


FIG. 1
PRIOR ART

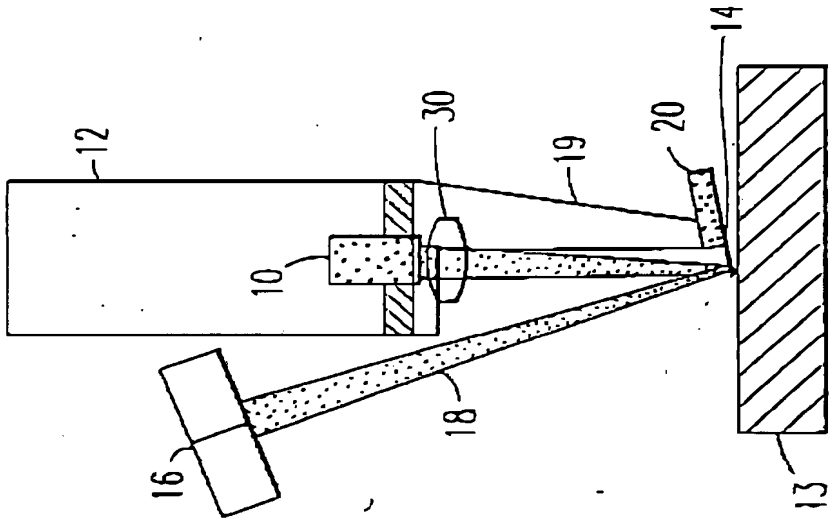


FIG. 3
PRIOR ART

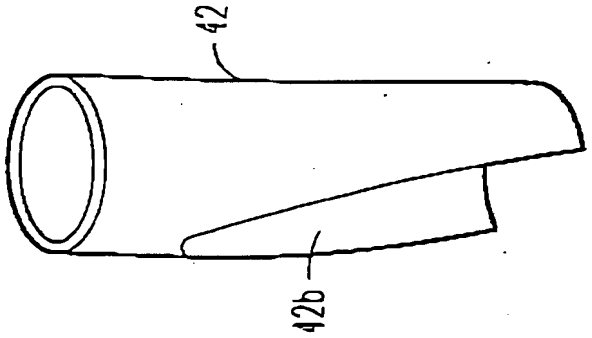


FIG. 4B

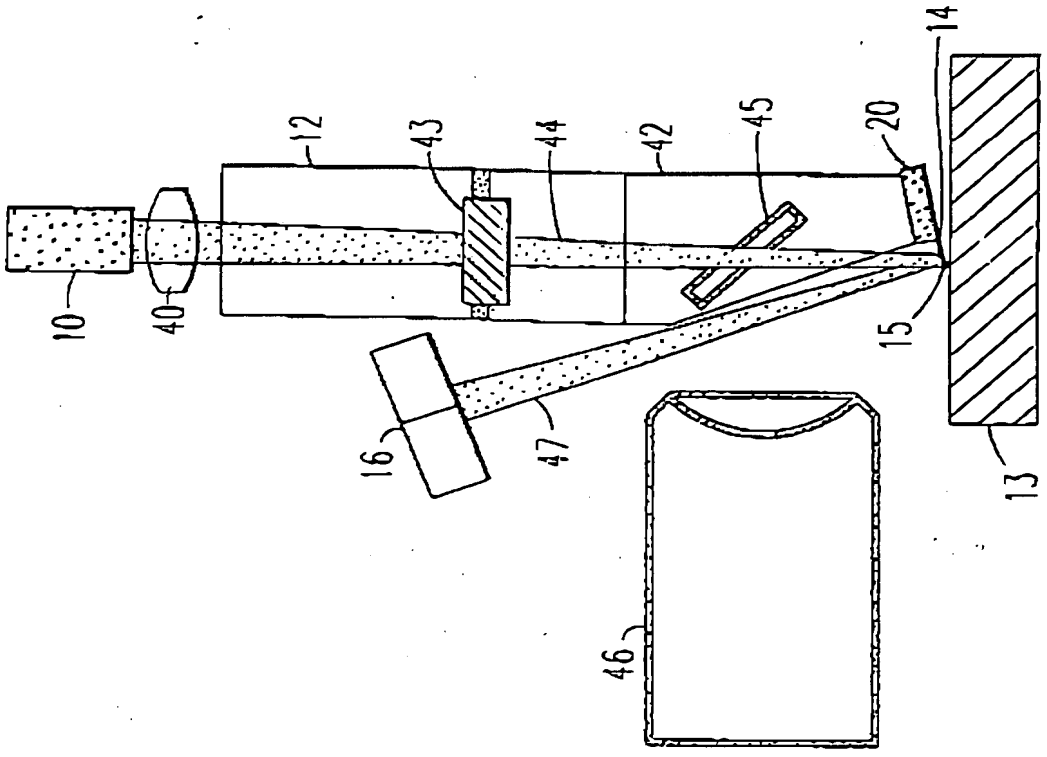


FIG. 4A

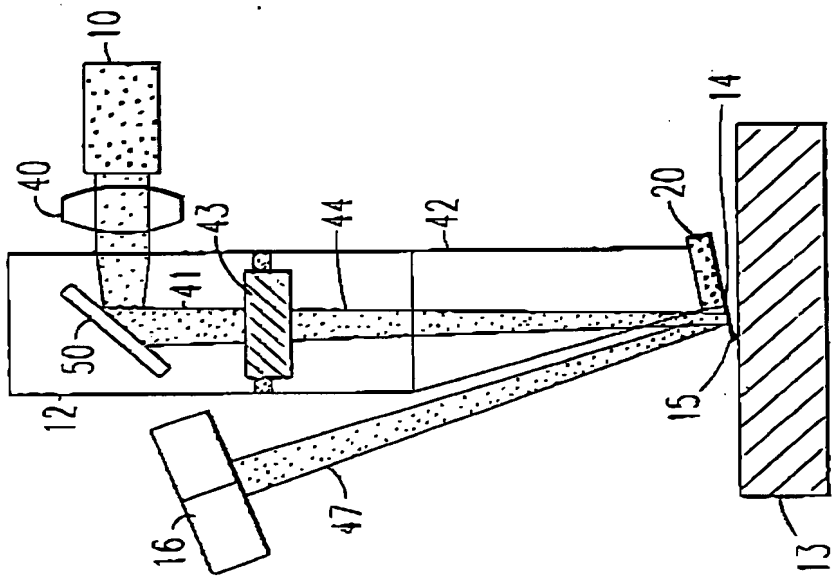


FIG. 6

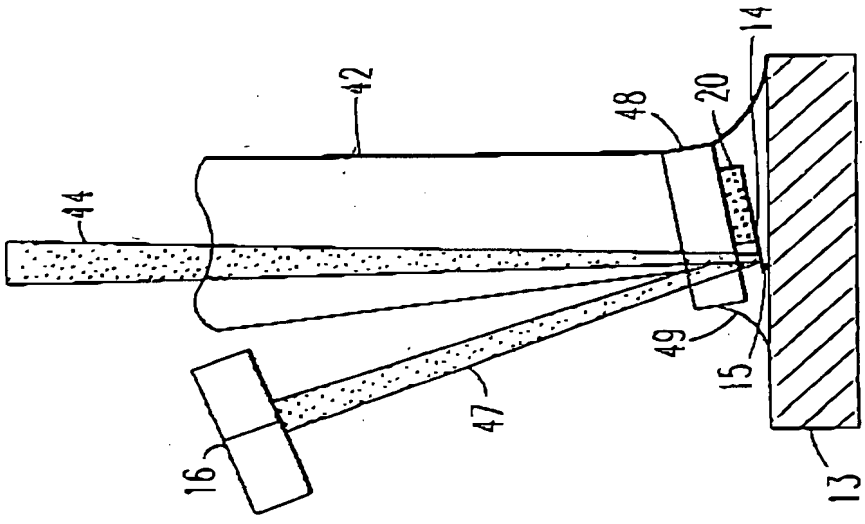


FIG. 5

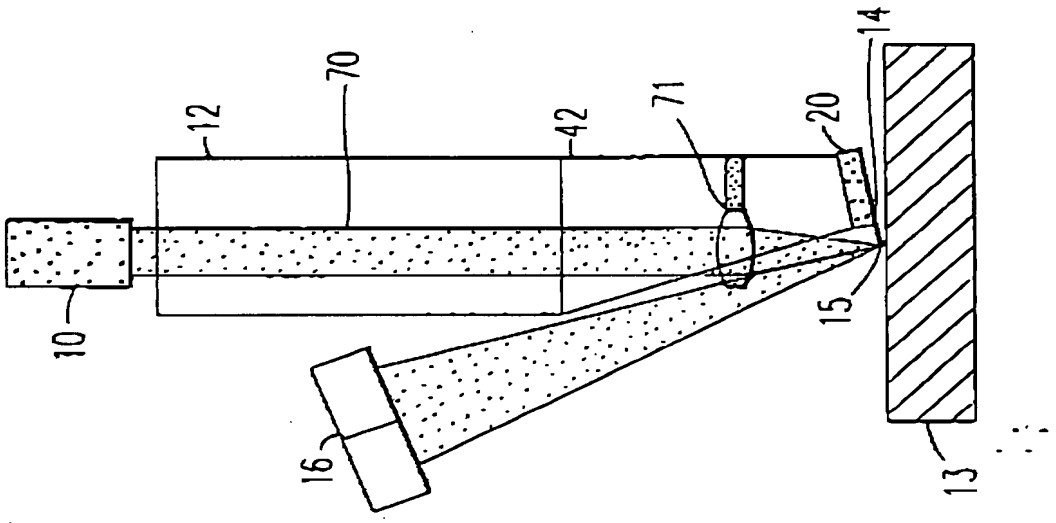

14
70
12
42
71
20
10
15
16
13

FIG. 8

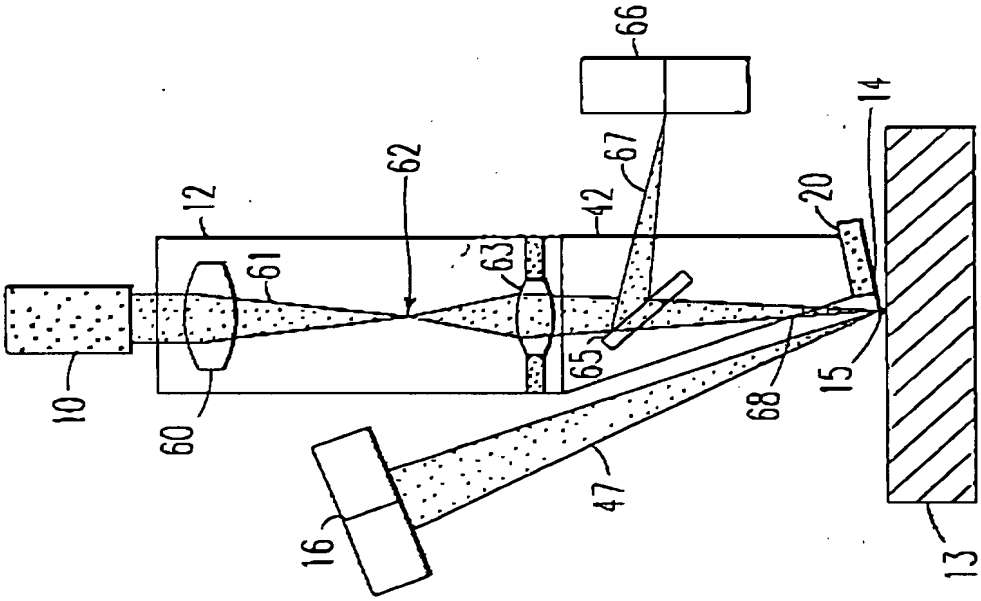

66
14
62
67
12
42
20
61
63
10
65
15
60
68
47
16
13

FIG. 7

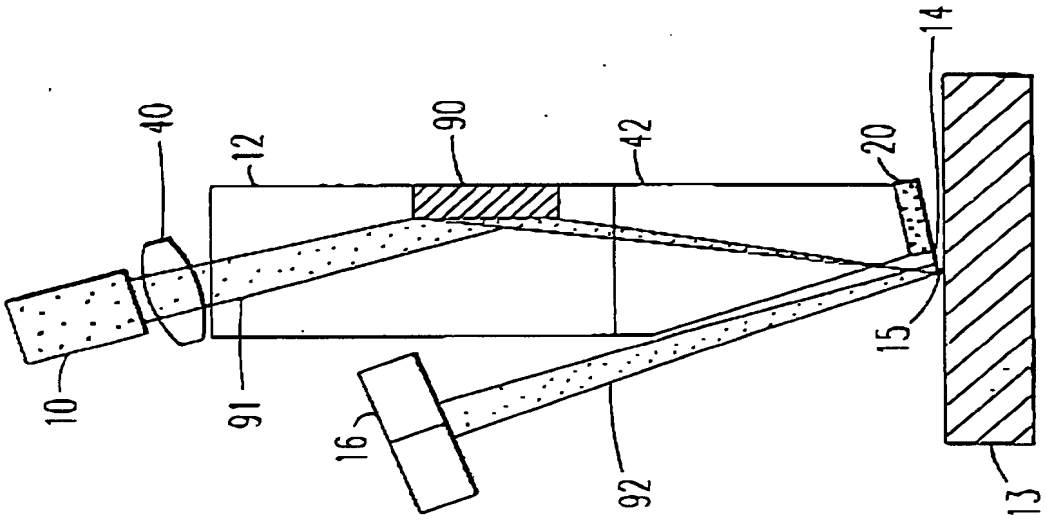


FIG. 10

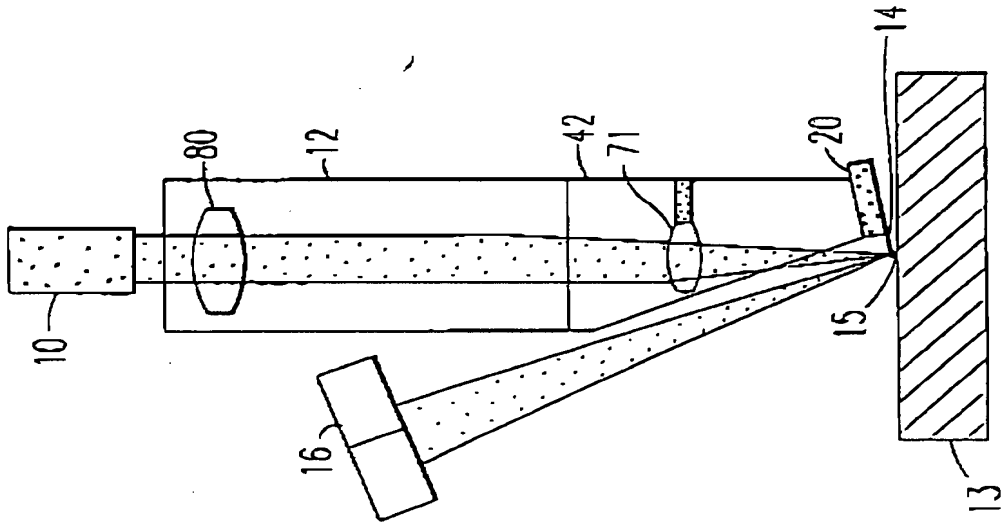


FIG. 9

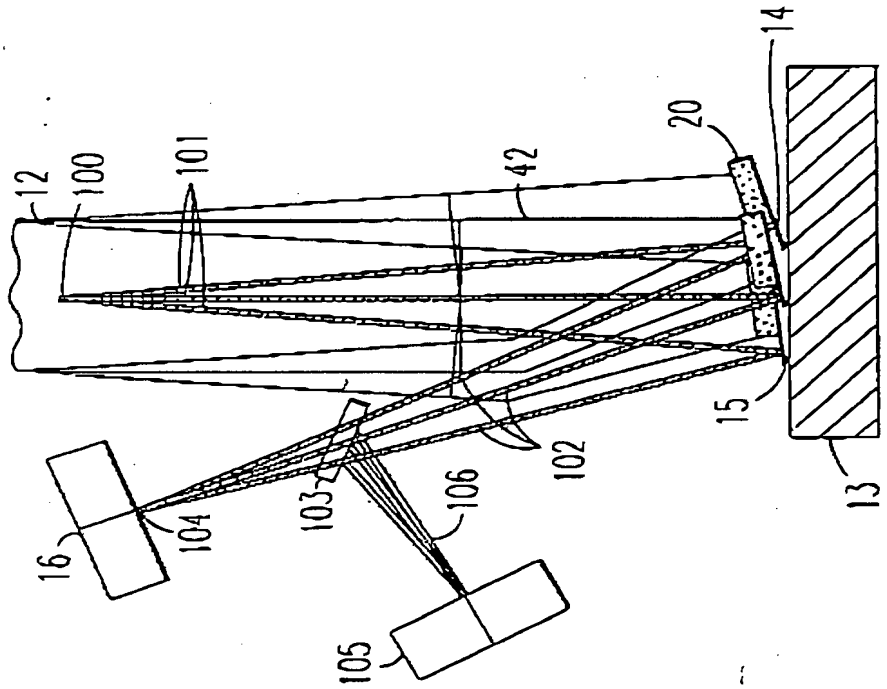


FIG. 11

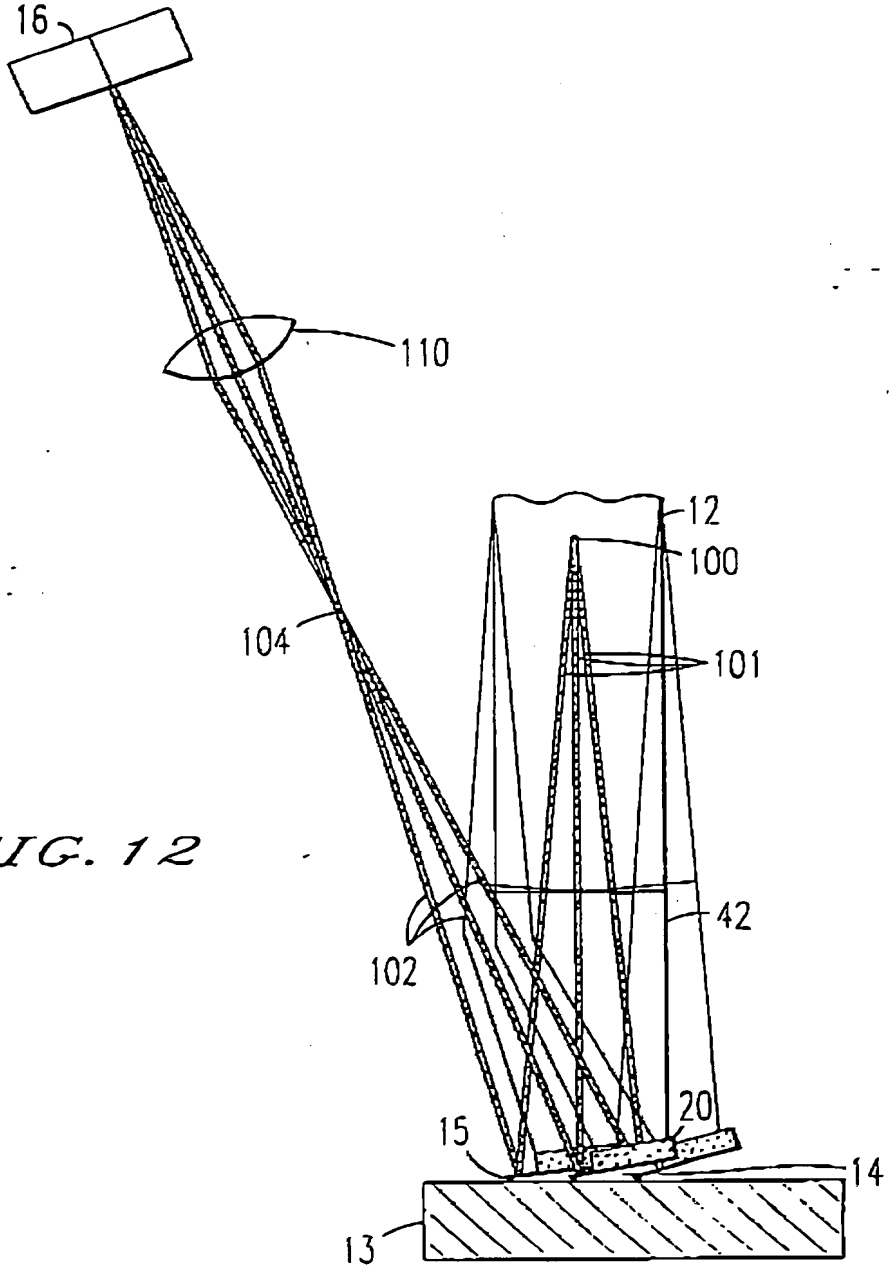
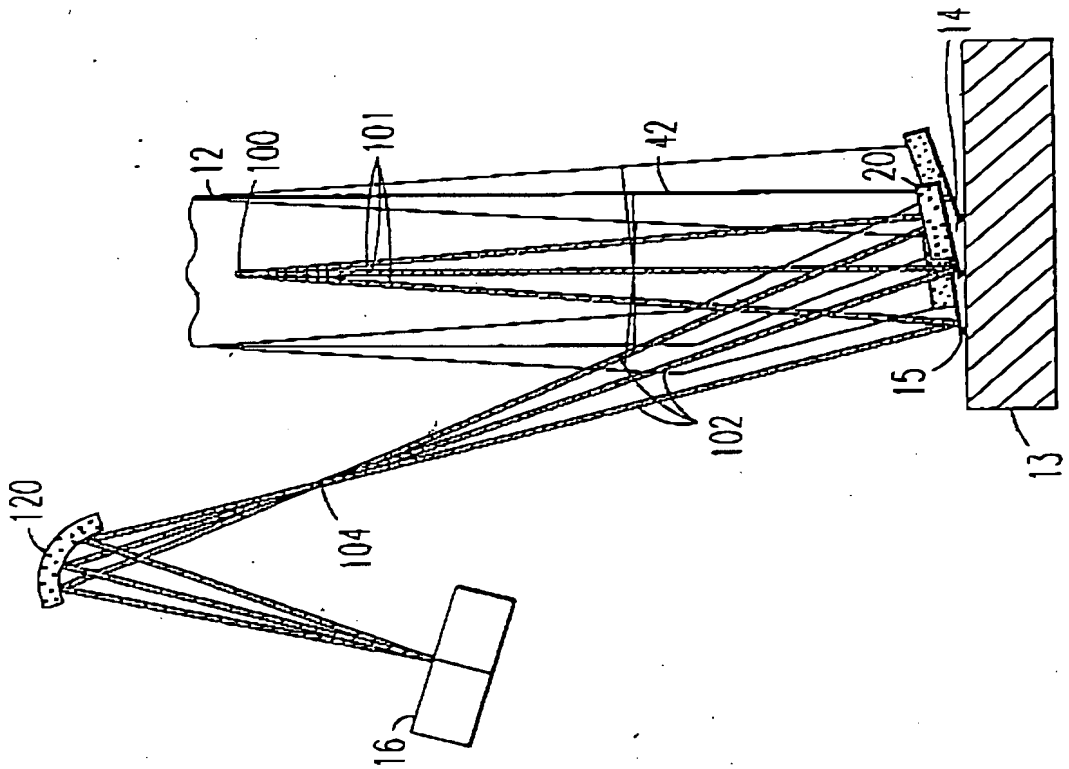


FIG. 12

FIG. 13



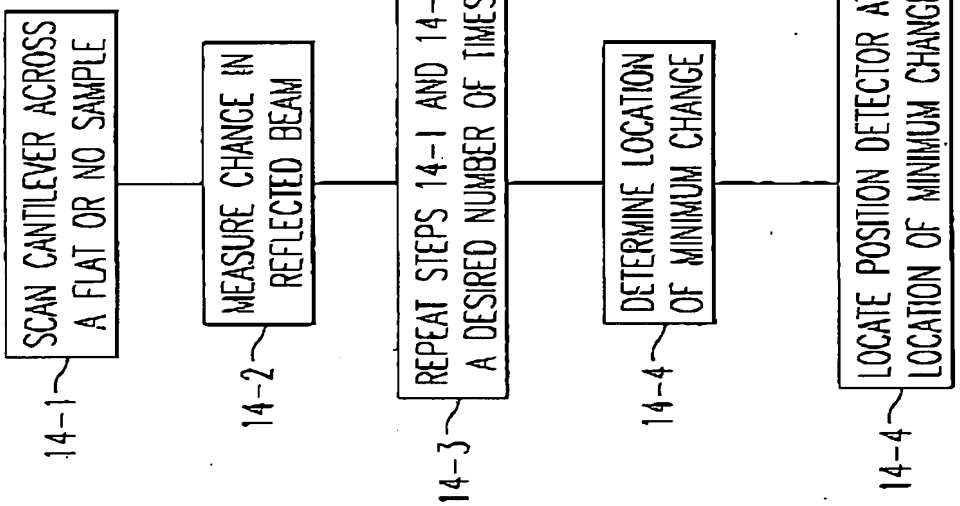

SCAN CANTILEVER ACROSS A FLAT OR NO SAMPLE
14-1
MEASURE CHANGE IN REFLECTED BEAM
14-2
REPEAT STEPS 14-1 AND 14-2 A DESIRED NUMBER OF TIMES
14-3
DETERMINE LOCATION OF MINIMUM CHANGE
14-4
LOCATE POSITION DETECTOR AT LOCATION OF MINIMUM CHANGE
14-4

FIG. 14